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FILE 'MEDLINE, CAPLUS, USPATFULL' ENTERED AT 13:55:47 ON 06 SEP 2005

L1 5109 S AQUAPORIN#
L2 45 S L1 (P) (OPTIC?)
L3 16 S L2 (P) (AQUAPORIN-4)

ANSWER 15 OF 16 CAPLUS COPYRIGHT 2005 ACS on STN
AN 1998:214009 CAPLUS
DN 129:3022
TI **Aquaporin-4** water channel protein in the rat retina and **optic** nerve: polarized expression in Muller cells and fibrous astrocytes
AU Nagelhus, Erlend A.; Veruki, Margaret L.; Torp, Reidun; Haug, Finn-M.; Laake, Jon H.; Nielsen, Soren; Agre, Peter; Ottersen, Ole P.
CS Department of Anatomy Institute of Basic Medical Sciences, University of Oslo, Oslo, N-0317, Norway
SO Journal of Neuroscience (1998), 18(7), 2506-2519
CODEN: JNRSDS; ISSN: 0270-6474
PB Society for Neuroscience
DT Journal
LA English
AB The water permeability of cell membranes differs by orders of magnitude, and most of this variability reflects the differential expression of **aquaporin** water channels. We have recently found that the CNS contains a member of the **aquaporin** family, **aquaporin-4** (AQP4). As a prerequisite for understanding the cellular handling of water during neuronal activity, we have investigated the cellular and subcellular expression of AQP4 in the retina and **optic** nerve where activity-dependent ion fluxes have been studied in detail. In situ hybridization with digoxigenin-labeled riboprobes and immunogold labeling by a sensitive postembedding procedure demonstrated that AQP4 and AQP4 mRNA were restricted to glial cells, including Muller cells in the retina and fibrous astrocytes in the **optic** nerve. A quant. immunogold anal. of the Muller cells showed that these cells exhibited three distinct membrane compartments with regard to AQP4 expression. End feet membranes (facing the vitreous body or blood vessels) were 10-15 times more intensely labeled than non-end feet membranes, whereas microvilli were devoid of AQP4. These data suggest that Muller cells play a prominent role in the water handling in the retina and that they direct osmotically driven water flux to the vitreous body and vessels rather than to the subretinal space. Fibrous astrocytes in the **optic** nerve similarly displayed a differential compartmentation of AQP4. The highest expression of AQP4 occurred in end feet membranes, whereas the membrane domain facing the nodal axolemma was associated with a lower level of immunoreactivity than the rest of the membrane. This arrangement may allow transcellular water redistribution to occur without inducing inappropriate volume changes in the perinodal extracellular space.

ANSWER 14 OF 16 CAPLUS COPYRIGHT 2005 ACS on STN

AN 2001:318980 CAPLUS

DN 135:14526

TI A novel role of vasopressin in the brain: modulation of activity-dependent water flux in the neocortex

AU Niermann, Heike; Amiry-Moghaddam, Mahmood; Holthoff, Knut; Witte, Otto W.; Ottersen, Ole Petter

CS Department of Neurology, Heinrich Heine University, Dusseldorf, D-40225, Germany

SO Journal of Neuroscience (2001), 21(9), 3045-3051
CODEN: JNRSDS; ISSN: 0270-6474

PB Society for Neuroscience

DT Journal

LA English

AB The brain contains an intrinsic vasopressin fiber system the function of which is unknown. It was demonstrated recently that astrocytes express high levels of a H2O channel, **aquaporin-4** (AQP4). Because vasopressin is known to regulate **aquaporin** expression and translocation in kidney collecting ducts and thereby control H2O reabsorption, the authors hypothesized that vasopressin might serve a similar function in the brain. By recording intrinsic **optical** signals in an acute cortical slice preparation the authors showed that evoked neuronal activity generates a radial H2O flux in the neocortex. The rapid onset and high capacity of this flux suggest that it is mediated through the AQP4-containing astrocytic syncytium that spans the entire thickness of the neocortical mantle. Vasopressin and vasopressin receptor V1a agonists were found to facilitate this flux. V1a antagonists blocked the facilitatory effect of vasopressin and reduced the H2O flux even in the absence of any exogenous agonist. V2 agonists or antagonists had no effect. These data suggest that vasopressin and V1a receptors play a crucial role in the regulation of brain H2O and ion homeostasis, most probably by modulating **aquaporin**-mediated H2O flux through astrocyte plasma membranes.

Role of aquaporin-4 water channel in the development and integrity of the blood-brain barrier

AU Nico, Beatrice; Frigeri, Antonio; Nicchia, Grazia Paola; Quondamatteo, Fabio; Herken, Rainer; Errede, Mariella; Ribatti, Domenico; Svelto, Maria; Roncali, Luisa

CS Department of Human Anatomy and Histology, University of Bari Medical School, Bari, I-70124, Italy

SO Journal of Cell Science (2001), 114(7), 1297-1307
CODEN: JNCSAI; ISSN: 0021-9533

PB Company of Biologists Ltd.

DT Journal

LA English

AB In this study, the authors have investigated the expression of **aquaporin 4** during blood-brain barrier development in the **optic** tectum of chick embryos and newly hatched chicks, by western-blot, reverse transcriptase-polymerase chain reaction, immunohistochem., and freeze-fracture and high-resolution immunogold electron microscopy. In the **optic** tecta of day-14 embryos, western blot anal. revealed an approx. 30-kDa band, immunoreactive for **aquaporin-4**, which was increased in day-20 embryos and in chicks. Semi-quant. reverse transcriptase chain reaction expts. showed that there was already a high level of **aquaporin-4** mRNA in day-9 embryos as well as in the subsequent stages and in newly hatched chicks. Immunohistochem., reactivity for **aquaporin-4** was detected in the **optic** tectum of day-14 embryos; similar results were obtained in telencephalon and cerebellum. Ultrastructurally, the microvessels of the tectum showed immunoreactivity for **aquaporin-4** on the astroglial endfeet, which discontinuously surrounded endothelial cells joined by immature tight junctions. In the tectum, telencephalon and cerebellum of 20-day embryos and chicks, **aquaporin-4** strongly labeled the ependymal cells and the subpial glial membranes, as well as the bodies and processes of astroglial cells. A continuous **aquaporin-4** staining was found around the microvessel endothelial cells, which were sealed off from one another by extensive tight junctions. A complete astrocytic sheath, labeled by anti-**aquaporin-4** gold particles, enveloped the endothelium-pericyte layer. Orthogonal arrays of particles were observed on fractured astrocytic membranes, starting from embryonic day 14 when the **aquaporin-4** immunogold staining revealed clusters of gold particles, often forming square or rectangular clusters. The results showed that **aquaporin-4** expression and organization of the intramembrane particles in orthogonal arrays followed the same temporal sequence. Finally, the lipopolysaccharide, a substance that induces blood-brain barrier disruption, dets. a remarkable reduction in **aquaporin-4** labeling, expressed by a few **aquaporin-4** gold particles attached on swollen perivascular glial membranes. All these data show that **aquaporin-4** expression occurs in the chick embryonic brain, in parallel with maturation and functioning of the blood-brain barrier and suggest that there is a close relationship between water transport regulation and brain development.

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ANSWER 12 OF 16 CAPLUS COPYRIGHT 2005 ACS on STN

AN 2003:690791 CAPLUS

DN 139:305790

TI Relationship between AQP4 expression and DWI of the cerebral ischemic edema in rats

AU Lu, Hong; Sun, Shan-quan

CS Department of Anatomy, Chongqing University of Medical Sciences, Chungking, 400016, Peop. Rep. China

SO Journal of Medical Colleges of PLA (2003), 18(3), 159-164
CODEN: JMCPE6; ISSN: 1000-1948

PB Journal of Medical Colleges of PLA, Editorial Board

DT Journal

LA English

AB Objective: To study the correlation between **aquaporin-4** (AQP4) expression and diffusion-weighted imaging (DWI) in the process of ischemic brain edema for the mol. biol. mechanism of DWI. Methods: A total of 34 Wistar rats were divided into 8 groups randomly: Non-operated group (n = 4), sham-operated group (n = 6), and operated group, receiving right middle cerebral artery occlusion (MCAO) for 15 and 30 min, and 1, 3, 6 and 24 h resp. (6 subgroups, n = 4). All groups were imaged with DWI and T2WI. The apparent diffusion coefficient (ADC), relevant d. (rd) and relevant area (rs) of hyperintensity of the lesions on DWI and T2WI were measured. Relevant ADC (rADC), relevant area of immunohistochem. staining for AQP4 (rS), **optical** d. of AQP4 hybridization (α) were calculated After that the animals were sacrificed and perfused at different time intervals, correlations between DWI, ADC, and AQP4 expression (rS, α) in ischemic tissue was made. Results: There was a significant correlation between rS and α (r = 0.949). The abnormal high intensity was found in DWI of the ipsilateral MAC territory at 15 min after MCAO. The ADC value decreased quickly within 1 h after MCAO, the rd and rs of DWI increased rapidly and the expression of AQP4 increased quickly, too. However, there was no change on the T2WI. In the period of time (15 min - 1 h), the AQP4 expression(α) had a strong relation to the rd and rs (r = 0.914, 0.895). With the progress of the time, the ADC value of MCAO decreased further to (2.1 ± 0.6) + 10-4 mm2/s at 3 h, and then followed an increased slowly till 24 h, but the rd and the rs as well as the expression of AQP4 continuously increased during the stage. The T2WI detected the lesion at the average time (1.4 h) after MCAO, and the rs of T2WI was less than that of DWI at the same time in the same layer ($P < 0.05$). Conclusion: The results imply that high expression of AQP4 may play a key role in ischemic brain edema. It is, certainly, one of the important reasons of the DWI mol. biol. mechanism in the cerebral ischemia.

The role of aquaporin-4 in the blood-brain barrier development and integrity: Studies in animal and cell culture models

AU Nicchia, G. P.; Nico, B.; Camassa, L. M. A.; Mola, M. G.; Loh, N.; Dermietzel, R.; Spray, D. C.; Svelto, M.; Frigeri, A.

CS Department of General and Environmental Physiology and Centre of Excellence in Comparative Genomics (CEGBA), University of Bari, Bari, I-70126, Italy

SO Neuroscience (Oxford, United Kingdom) (2004), 129(4), 935-945
CODEN: NRSCDN; ISSN: 0306-4522

PB Elsevier Ltd.

DT Journal; General Review

LA English

AB **Aquaporin-4** (AQP4) is the major water channel expressed in brain perivascular astrocyte processes. Although the role of AQP4 in brain edema has been extensively investigated, little information exists regarding its functional role at the blood-brain barrier (BBB). The purpose of this work is to integrate previous and recent data regarding AQP4 expression during BBB formation and depending on BBB integrity, using several exptl. models. Results from studies on the chick **optic** tectum, a well-established model of BBB development, and the effect of lipopolysaccharide on the BBB integrity and on perivascular AQP4 expression have been analyzed and discussed. Moreover, data on the BBB structure and AQP4 expression in murine models of Duchenne muscular dystrophy are reviewed. In particular, published results obtained from mdx3cv mice have been analyzed together with new data obtained from mdx mice in which all the dystrophin isoforms including DP71 are strongly reduced. Finally, the role of the endothelial component on AQP4 cellular expression and distribution has been investigated using rat primary astrocytes and brain capillary endothelial cell co-cultures as an in vitro model of BBB.

PubMed ID: 9502811

TI **Aquaporin-4** water channel protein in the rat retina and **optic** nerve: polarized expression in Muller cells and fibrous astrocytes.

AU Nagelhus E A; Veruki M L; Torp R; Haug F M; Laake J H; Nielsen S; Agre P; Ottersen O P

CS Department of Anatomy, Institute of Basic Medical Sciences, University of Oslo, N-0317 Oslo, Norway.

SO Journal of neuroscience : official journal of the Society for Neuroscience, (1998 Apr 1) 18 (7) 2506-19.
Journal code: 8102140. ISSN: 0270-6474.

CY United States

DT Journal; Article; (JOURNAL ARTICLE)

LA English

FS Priority Journals

EM 199804

ED Entered STN: 19980416
Last Updated on STN: 19980416
Entered Medline: 19980407

AB The water permeability of cell membranes differs by orders of magnitude, and most of this variability reflects the differential expression of **aquaporin** water channels. We have recently found that the CNS contains a member of the **aquaporin** family, **aquaporin-4** (AQP4). As a prerequisite for understanding the cellular handling of water during neuronal activity, we have investigated the cellular and subcellular expression of AQP4 in the retina and **optic** nerve where activity-dependent ion fluxes have been studied in detail. In situ hybridization with digoxigenin-labeled riboprobes and immunogold labeling by a sensitive postembedding procedure demonstrated that AQP4 and AQP4 mRNA were restricted to glial cells, including MHller cells in the retina and fibrous astrocytes in the **optic** nerve. A quantitative immunogold analysis of the MHller cells showed that these cells exhibited three distinct membrane compartments with regard to AQP4 expression. End feet membranes (facing the vitreous body or blood vessels) were 10-15 times more intensely labeled than non-end feet membranes, whereas microvilli were devoid of AQP4. These data suggest that MHller cells play a prominent role in the water handling in the retina and that they direct osmotically driven water flux to the vitreous body and vessels rather than to the subretinal space. Fibrous astrocytes in the **optic** nerve similarly displayed a differential compartmentation of AQP4. The highest expression of AQP4 occurred in end feet membranes, whereas the membrane domain facing the nodal axolemma was associated with a lower level of immunoreactivity than the rest of the membrane. This arrangement may allow transcellular water redistribution to occur without inducing inappropriate volume changes in the perinodal extracellular space.

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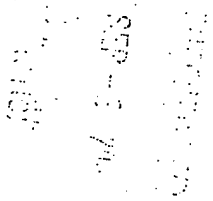

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